Announcing the Final Examination of Justin Reyes for the degree of Doctor of Philosophy in Physics

Date: June 30, 2020
Time: 2:00 p.m.

Room: Online: Join Zoom Meeting

https://zoom.us/j/99510709522?pwd=eWpQUHhLdEI2KzdaU3lqZjhETDY1UT09

Meeting ID: 995 1070 9522

Password: 7MAAdK

Dissertation title: Tensor Network States: Optimizations and Applications in Quantum Many-Body Physics and Machine Learning

Abstract:
Tensor network states are ubiquitous in the investigation of quantum many-body (QMB) physics. Their advantage over other state representations is evident from their reduction in the computational complexity required to obtain various quantities of interest, namely observables. Additionally, they provide a natural platform for investigating entanglement properties within a system. In this dissertation, we develop various novel algorithms and optimizations to tensor networks for the investigation of QMB systems, including classical and quantum circuits. Specifically, we study optimizations for the two-dimensional Ising model in a transverse field, we create an algorithm for the k-SAT problem, and we study the entanglement properties of random unitary circuits. In addition to these applications, we reinterpret renormalization group principles from QMB physics in the context of machine learning to develop a novel algorithm for the tasks of classification and regression, and then utilize machine learning architectures for the time evolution of operators in QMB systems.

Outline of Studies:
Major: Physics

Educational Career:
B. S. University of Central Florida, USA, 2015

Committee in Charge:
Dr. Eduardo Mucciolo (Chair)
Dr. Joseph Harrington
Dr. Luca Argenti
Dr. Dan Marinescu (External Committee Member)

Approved for distribution by Dr. Eduardo Mucciolo, Committee Chair, on May 26, 2020.

The public is welcome to attend remotely.